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is inserted into the inner side of the back of the head of the humerus, in front of the insertion of the *subscapularis*.

10. *M. subscapularis*, 0·01 } . . 0·01 oz.
 „ 0·01 }

Origin from the inner and lower border of the scapula, half an inch from glenoid; inserted into the top and back of the inner side of the head of the humerus, inside the insertion of the *spinati*.

10. *M. serratus magnus*, 0·14 } . . 0·115 oz.
 „ 0·09 }

Arises from second and third ribs in the usual manner, and is inserted as usual.

11. *M. biceps humeri*, 0·01 } . . 0·025 oz.
 „ 0·04 }

The Rev. SAMUEL HAUGHTON, M. D., Fellow of Trinity College, Dublin, read the following paper:—

NOTES ON ANIMAL MECHANICS.

NO. XI.—MUSCULAR ANATOMY OF THE RHEA (*Struthio Rhea*).

I AM indebted to Mr. Thomas Moore, Curator of the Derby Museum of Liverpool, for the opportunity of dissecting the Rhea, which forms the subject of this notice. It was a male bird, and seemed to be in good condition.

A.—Muscles of the Hip and Knee Joints.

1. *M. psoas magnus*, none.
 2. *M. iliacus*, none.
 3. *M. pectinæus*, 0·12 oz.

Arises immediately in front of the acetabulum (Fig. 32, *p.*), and is inserted into the top of the linea aspera.

4. *M. adductor brevis*, none.
 5. *M. adductor magnus*, 2·60 oz.

Arises from the lower border of the ilium, forming the upper margin of the ischiadic foramen, *y* (Fig. 32), and the prolongation of this bone backwards in conjunction with the ischium (Fig. 32, *ad. mg.*); it is partly inserted into the top of the linea aspera, and partly into the tendon of the *semimembranosus* that is attached to the femur; the tendinous slip that joins these muscles helps them both to pull on the same tendon at the back of the femur.

6. *M. obturator externus*, 0·51 oz.
 Arises from the upper margin of the anterior half of the ischium (Fig. 32, *o. e.*), and from the membrane of the ischiadic foramen, and

Fig. 32.

is inserted by means of a strong tendon (Fig. 33, *o. e.*) into the back of the outer side of the head of the femur, behind the *gluteus medius*.

7. *M. obturator internus*, 2·25 oz.
 8. *M. gemellus anterior*, 0·08 oz.

Arises from the point marked (Fig. 32, *gm.*) in front of the tendinal foramen *x*; and is inserted into the back of the femur (Fig. 33, *gm.*) behind the tendon of the *M. obturator*.

9. *M. adductor longus*, 1·00 oz.

Arises by fascia from the anterior two-thirds of the lower border of the ischium (Fig. 32, *ad. l.*), and is inserted into the lower half of the linea aspera and into the tibia.

N. B.—This muscle is double; its posterior portion weighs 0·14 oz., and is inserted into the lower third only of the linea aspera; the anterior portion is inserted as above described.

10. *M. aginator caudæ et tensor vaginae femoris*, 6·02 oz.

Arises by slip of fascia from the præ-acetabular edge of the ilium overlying the posterior portion of the *gluteus medius*, and from the post-acetabular edge of the ilium overlying the *biceps femoris*. It is inserted partly by fascia into the outer side of the patella, and partly into the lower margin of the *vastus externus* (1).

11. *M. glutæus maximus*, 0·23 oz.
Arises from the line marked (Fig. 32, *gl. mx.*) at the acetabular prominence of the ilium.

12. *M. glutæus medius*, 2·05 oz.
Fig. 33.

Its origin and insertion are marked in Figs. 32 and 33, *gl. md.*

13. *M. glutæus minimus*, 0·25 oz.

14. *M. glutæus quartus*
(*iliocapsularis*), 0·23 oz.

The origin and insertion of these muscles are marked in Figs. 32 and 33, *gl. mn.* and *il. cp.*

15. *M. biceps femoris*, 3·80 oz.

The origin of this muscle on the postacetabular surface of the ilium is marked in Fig. 32; and it is inserted by the usual pulley at the back of the outer head of the *gastrocnemius* into the tubercle of the fibula.

16. *M. semimembranosus*, 2·30 oz.

Arises from the posterior portions of the ilium and ischium (Fig. 32, *s. m.*); and is inserted partly by a tendon into the top of the linea aspera, and partly by a tendon, which is aided (as in the Emu) by an accessory muscle, and which itself has a double insertion by means of two flat tendons into the head of the inner *gastrocnemius*, and into the middle point of the broad insertion of the *semitendinosus* into the tibia.

N. B.—This muscle, as already noticed, is connected with the *adductor magnus* by a tendinous slip.

17. *M. semimembranoso accessorius*, 0·50 oz.

This muscle is shown in Fig. 34, and its general arrangement and connexion with the *semimembranosus* are similar to those already described in the case of the Emu.

18. *M. semitendinosus*, 0·71 oz.

Arises from the lower margin of the anterior half of the ischium (Fig. 32, *s. t.*), and is inserted by means of a broad tendon into the fascia of the upper and inner part of the leg, with a slip passing on to the heel.

19. *M. gracilis*, 0·12 oz.

Arises from the anterior spine of the pubes (Fig. 32, *gr.*), and terminates in a slender tendon which passes over the patella, from within outwards, across the knee joint under the anterior head of the *gastrocnemius* and *solaus*, outwards and downwards to the calf of the leg, being strapped down by the tendon of the *biceps* at its insertion into the fibula, at one inch below which it expands into a fan-shaped tendon spread over the back of the fascia, enclosing the first *flexor perforatus digiti medii* and the *flexor perforatus digiti externi*; this fan-shaped expansion of the tendon of *gracilis* is also connected by means of an auxiliary tendon passing backwards, with the inner side of the head of the second *flexor perforatus digiti medii*. The three tendons of the flexors just named, and so placed in relation with the *gracilis*, pass together into the toes.

N. B.—The *gracilis* muscle in the Rhea performs the mechanical duty assigned by me to the *rectus femoris* in the Ostrich, and serves to bring into simultaneous action all the flexors of the foot and extensors of the leg.

20. *M. sartorius*, 2·80 oz.

Arises from the anterior surface of the ilium (Fig. 32, *s. s.*), and from the backs of the last two ribs overlying the *gluteus medius*; and is inserted by a broad tendon into the head of the tibia.

21. *M. rectus femoris*, none.

22. *M. vastus externus* (1), (Fig. 33, *v. e. 1*), 5·07 oz.
Origin and insertion as in Emu.

23. *M. vastus externus* (2), (Fig. 33, *v. e. 2*), 0·40 oz.

As in the Emu, with its tendon passing under the head of the *gastrocnemius* to be inserted into the outer tubercle of the tibia.

N. B.—This tendon binds down the tendon of the *gracilis* after it has crossed in front of the knee joint.

24. *M. vastus internus* (1), (Fig. 33, v. i. 1), 0·95 oz.

Origin and insertion as in the Emu.

25. *M. vastus internus* (2), (Fig. 33, v. i. 2), 0·95 oz.

Generally as in the Emu, but not so easily divisible into three portions; inserted into the inner head of the tibia.

26. *M. popliteus*, 0·21 oz.

B.—*Muscles of the Ankle and Toes.*

1. *M. gastrocnemius*, 11·16 oz.

α, Outer head, as in the Emu, . . 2·81

β, Origin from condyloid pit, . . 1·74

γ, Inner head, 6·61

11·16 oz.

γ. This portion of the *gastrocnemius* takes its origin from the back of the inner condyle, from the inner surface of the anterior tubercle, and from the whole head of the tibia, as well as from the side of the ligamentum patellæ.

2. *M. plantaris*, 0·50 oz.

Arises from the posterior ligament of the knee joint, on the inner side, and is blended at its insertion with the inner surface of the tendo Achillis formed by the *gastrocnemius*.

3. *M. solæus*, 4·12 oz.

Origin and insertion as in the Emu. Its tendon forms the anterior side of the sheath for the tendons of the heel, while the tendon of the *gastrocnemius* forms the posterior side; the secondary slip of the tendon of the *solæus* joins the side of the tendon of the first *flexor perforatus digiti medii* at five inches below the heel joint.

4. *M. flexor perforatus primus digiti medii*, 0·74 oz.

Inserted into the near ends of the first and second phalanx of the middle toe.

5. *M. flexor perforatus digiti externi*, 0·54 oz.

Inserted into the distal ends of the first phalanx of the outer toe.

6. *M. flexor perforatus secundus digiti medii*, 0·27 oz.

Arises from the outer ligament of the knee joint, and is inserted into the near ends of the ungual phalanx of the middle toe.

N. B.—The tendons of the first and second flexor of the middle toe are free in the Rhea, and not united by a cross slip, as in the Emu.

7. *M. flexor perforatus digiti interni*, 0·23 oz.
Arises from the fascia covering the inner surface of *solæus*, and is inserted into the near ends of the first phalanx of the inner toe.

8. *M. flexor hallucis longus*, 0·10 oz.
Arises from the outer ligament of the knee joint, and is inserted into the near ends of the ungual phalanx of the inner toe, the largest tendon being distributed to the outer side of the toe.

9. *M. flexor communis perforans*, 1·22 oz.
This muscle is formed, as in the Emu, of two distinct muscles, whose tendons unite halfway down the cannon bone.

a. This is a double-headed muscle, taking its origin from the backs of both condyles, 0·24 oz.

β. Arises from the whole posterior surfaces of the tibia and fibula, 0·98 oz.

1·22 oz.

10. *M. tibialis anticus*, 1·52 oz.

A two-headed muscle, as in the Emu, taking one origin from the outer and anterior tubercles of the tibia, and another by a round tendon, inside the knee joint, from the anterior surface of the outer condyle of the femur.

11. *M. extensor digitorum communis*, 0·63 oz.
Arises from the anterior surfaces of the tibia and fibula, and is inserted into the backs of the ungual phalanges, and into the common sheath of the back of the foot.

C.—*Muscles of the Wings.*

The wing of the Rhea, like that of the Ostrich, which it resembles in so many other respects, is much more fully developed than that of the Emu, as may be seen from the accompanying sketch (Fig. 35).

1. *M. trapezius*, 0·08 oz.
Arises from the transverse processes of the last cervical vertebra, and from the first rib, and is inserted into the acromial ridge at the top of the scapula.

2. *M. rhomboideus*, 0·02 oz.
Arises from the side of the third dorsal vertebra, and is inserted into the posterior inch of the back of the scapula.

3. *M. latissimus dorsi*, 0·15 oz.

4. *M. teres major*, 0·20 oz.

These muscles are very remarkable, and are well shown in Fig. 35 (*lat. d.* and *t. m.*). The *lat. dorsi* takes its origin from the central portion of the fourth rib ($1\frac{1}{2}$ inch), and is inserted into the top and back of the humerus, where it acts nearly as an opponent of the second pectoral, as a depressor of the arm.

Fig. 35.

The *teres major* takes its origin from the spinous processes of the first and second dorsal vertebræ, and from the interspinous ligament, and is inserted broadly (half an inch) into the middle of the deltoid ridge, lying under the deltoid itself.

- 5, 6. *M. pectoralis major et minor*, . . . 0·27 oz.

Arises from side of top of sternum and from upper sternal ribs, and is inserted into the pectoral ridge of the humerus, and into the sheath covering the *biceps humeri*.

7. *M. pectoralis secundus*,
0·37 oz.

Takes its origin from the coracoid bone, from the top of the sternum, and from the coraco-clavicular membrane; and is inserted into the top of the pectoral ridge.

N. B.—This muscle acts as a direct *levator humeri*, and its posterior fibres are continuous with those of the *deltoides*, which draws the humerus backwards and upwards.

8. *M. deltoideus externus*, 0·36 oz.

Takes its origin from the tip of the acromion, and from three-fourths of an inch of the scapula behind it; and is inserted halfway down the arm, along the back of the deltoid ridge.

9. *M. coracobrachialis*, 0·16 oz.

Arises from the posterior edge of the coracoid, and is inserted into the triangular space lying inside the pectoral ridge on the head of the humerus.

10. *M. triceps humeri* (Fig. 35, *tri*), 0·32 oz.

11. *M. supra et infraspinatus*, 0·08 oz.

Arises from the inferior surface of the whole acromion and top of the scapula, and is inserted into the lesser tuberosity.

12. *M. subscapularis*, 0·22 oz.

Arises from the whole lower and inner surface of the scapula, and is inserted into the back of the lesser tuberosity.

13. *M. serratus magnus*, 0·06 oz.

Arises from the first and second ribs.

14. *M. biceps humeri*, 0·15 oz.

Arises from the tip and posterior border of the coracoid, and is inserted into the tubercle of the radius.

N. B.—This muscle overlies the *coracobrachialis*.

The Rev. SAMUEL HAUGHTON, M. D., Fellow of Trinity College, Dublin, read the following paper:—

NOTES ON ANIMAL MECHANICS.

NO. XII.—ON THE MUSCULAR ANATOMY OF THE IRISH TERRIER, AS COMPARED WITH THAT OF THE AUSTRALIAN DINGO.

THE anatomy of the Dog is so well known, that I have not attempted in the following account to do more than exhibit the relative weights of the corresponding muscles in four typical specimens, and have added a few explanatory notes respecting facts that I have not found recorded in the writings of other anatomists who have described the muscles of the Dog.

The first Dog mentioned was a long-legged Irish Terrier, with about one-eighth Bull blood, and was a well-known fighting dog, of light weight.

The second Dog was very similar, but had not been trained to fight; he was a good water dog, and frequently caught and ate water hens, hunting on his own account.

The third Dog was a Dingo, long resident in the Zoological Gardens of Dublin, and his death was occasioned by his own misconduct; having devoured his four pups for breakfast, he was called to account for his misbehaviour by the mother of the pups, who throttled him on the spot, being persuaded, as some thought, that if she did not anticipate him, he would have proceeded to devour herself next.

The fourth Dog described was a Greyhound bitch, of excellent running qualities.

A.—*Muscles of the Hind Legs.*

It will be seen from a comparison of all the muscles that the Dingo is closely related to the Irish Terrier, but differs widely from the Greyhound.